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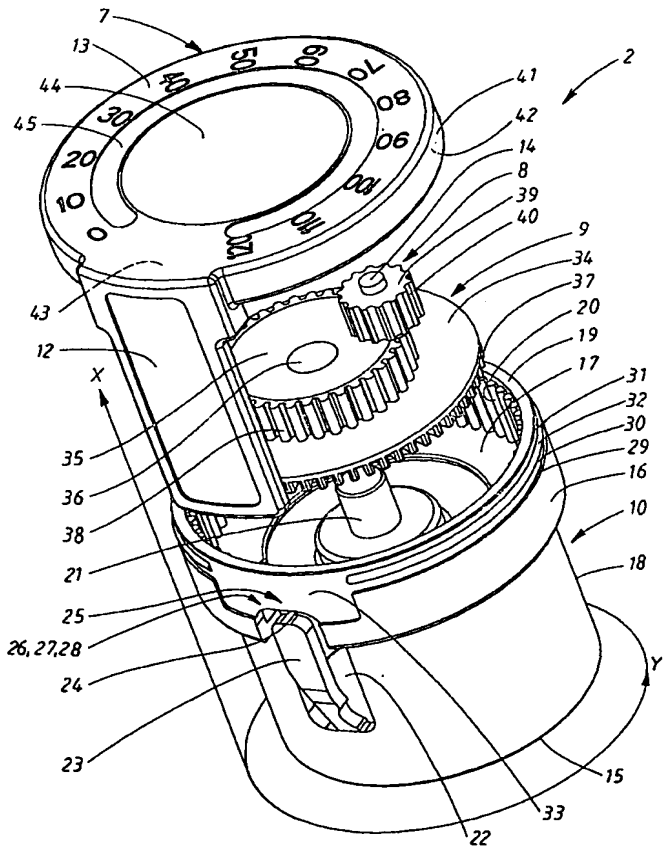
(54) Title: COUNTER FOR COUNTING DOSES



(57) Abstract: The present invention relates to a counter for counting the number of doses delivered from a container, in which a dose, as a result of a usage motion, is delivered from the container by way of a delivery device and, upon which usage motion, the container moves in relation to the delivery device, wherein the counter, which has an axial direction and a tangential direction and is fastened to the container or the delivery device, comprises a gear mechanism comprising two concentric wheels of different diameter in mutually fixed arrangement, and a pointer unit, both the gear mechanism and the pointer unit being rotatable once the counter is fastened; and also to a counter, wherein the said counter comprises a wheel and a marker means, wherein the pointer device is rotatable and the marker means is displaceable about the concentric centre axis of the gear mechanism once the counter is fastened and the said wheel has a substantially circular form, the counter being triggered upon the delivery of a dose; and, additionally, to a delivery device which is designed, in movable arrangement, with a container and incorporates a counter.

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Counter for counting doses

TECHNICAL FIELD

The present invention relates to a counter for counting the number of doses delivered from a container, in which a dose, as a result of a usage motion, is delivered from the container by way of a delivery device and, upon which usage motion, the container moves in relation to the delivery device, wherein the counter, which has an axial direction and a tangential direction and is fastened to the container or the delivery device, comprises a gear mechanism comprising two concentric wheels of different diameter in mutually fixed arrangement, and a pointer unit, both the gear mechanism and the pointer unit being rotatable once the counter is fastened. The present invention also relates to a counter for counting the number of doses delivered from a container, in which a dose, as a result of a usage motion, is delivered from the container by way of a delivery device and, upon which usage motion, the container moves in relation to the delivery device, wherein the counter, which has an axial direction and a tangential direction and is fastened to the container or the delivery device, comprises a pointer device comprising a wheel and a marker means, wherein the pointer device is rotatable and the marker means is displaceable about the concentric centre axis of the gear mechanism once the counter is fastened and the said wheel has a substantially circular form, the counter being triggered upon the delivery of a dose. Further, the present invention additionally relates to a delivery device which is designed, in movable arrangement, with a container and incorporates a counter according to the present invention.

PRIOR ART

It is normal for medication to be administered by being sprayed into the mouth cavity or into the nose. For this purpose, spray dose inhalers have

been developed which deliver one dose of medication per spraying. It is further expedient for a spray dose inhaler to be provided with means for indicating how many doses are left in the spray container belonging to the spray dose inhaler, this in order to prevent a spray container from being thrown away before it is empty. There are currently counters available which indicate how many doses are left in a spray container, allowing the consumption of medication from a spray dose inhaler to be monitored. An example is the counter according to Swedish patent SE C2 515858, which comprises a cap, a counting wheel and a control wheel, which all have a substantially circular form and are disposed concentrically in relation to one another and which, via a rod-shaped pin, which is disposed perpendicular to the inner face of the control wheel and is connected to the control wheel by a spring member, are actuated with each spraying, so that a dose step is added on by the counter.

In spite of existing counters, there is still a requirement for new counters offering alternative solutions for reliable functioning.

DESCRIPTION OF THE INVENTION

The present invention relates to a counter for counting the number of doses delivered from a container, in which a dose, as a result of a usage motion, is delivered from the container by way of a delivery device and, upon which usage motion, the container moves in relation to the delivery device, wherein the counter, which has an axial direction and a tangential direction and is fastened to the container or the delivery device, comprises a gear mechanism comprising two concentric wheels of different diameter in mutually fixed arrangement, and a pointer unit, both the gear mechanism and the pointer unit being rotatable once the counter is fastened and the said wheels and the pointer unit having a substantially circular form, and wherein the wheel of least diameter and the pointer unit are movably coupled, the counter being triggered whenever a dose is delivered, and the gear wheel of

greatest diameter being subjected to force action, whereupon the gear mechanism is rotated over a predetermined distance and, by virtue of the movable coupling, the pointer unit is also rotated over a predetermined distance, and both the gear mechanism and the pointer unit are displaced about the concentric centre axis of the gear mechanism, a ratio of at least 2:1 being obtained between the displacements of the gear mechanism and pointer unit respectively.

The delivery device can expediently be a spray dose inhaler, or the like, by which one dose of medication per spraying is delivered from a container, for example a spray container. The dose of medication can be delivered into the mouth cavity or into the nose.

By 'usage motion' is here meant the motion generated upon usage, i.e. the motion which ensures that a dose is delivered from the container by way of the delivery device. 'Usage motion' does not therefore include the return motion which always occurs, following delivery of a dose, when the container regains its original position to the delivery device.

Where a spray dose inhaler is used, a mouthpiece part of the spray dose inhaler is introduced into the mouth of a user and the spray container, which is inserted in the upper part of the spray part inhaler, is pressed farther into the upper part of the spray inhaler. 'The usage motion' is here that the spray container belonging to the spray dose inhaler is pressed farther into the upper part of the spray dose inhaler. As a result of the 'usage motion', a dose is hereupon released, which is sprayed into the mouth cavity of the user.

The counter comprises a gear mechanism and a pointer unit and the various components of the counter can be made of the same or different chosen suitable materials, for example plastics material. The pointer unit can additionally comprise a marker.

It should further here be added that the invention also comprises a counter, wherein the counter comprises a pointer device having a marker means, which pointer device does not necessarily comprise the said gear mechanism and pointer unit. Instead of the gear mechanism and the pointer unit, the counter can in this case comprise a pointer wheel. In this realization, the counter comprises one or more elements which is/are arranged so as to act in interaction, upon the said usage motion, so that the said pointer wheel is subjected to force action and thereupon rotates over a predetermined distance. The pointer wheel comprises a pointing means, for example a marker. Hence the description herein also applies to the counter in this realization, in which case the description, in this realization, has constantly to be adapted to the counter comprising the pointer wheel with pointing means, instead of the gear mechanism and the pointer unit. Thus, a description will also herein be given of a counter which comprises a pointer device comprising a wheel and a marker means, this description including the counter comprising the pointer wheel with the pointing means.

Returning to the first counter according to the description, wherein the two wheels of the gear mechanism and the pointer unit all have substantially circular form. The fact that they have substantially circular form means that the two wheels and the pointer unit can be designed with or without gear rings or the like, according to choice. Preconditions which limit the options with regard to the substantially circular forms are, firstly, that the functioning of the movable coupling, between the wheel of least diameter and the pointer unit, must be ensured and, secondly, that the counter must be sure to be triggered whenever a dose is delivered. The counter is triggered upon the delivery of a dose, i.e. upon the said usage motion, either by its motion in relation to the container or the delivery device, or by a force action, and herein, in both cases, the force action to which the gear wheel of greatest diameter is subjected. One 'increment', for example a step on a gear ring, on the gear wheel of greatest diameter corresponds to one dose.

By 'axial direction of the counter', furthermore, is here meant a direction which is parallel with the direction of the centre axis running through the two concentric wheels of the gear mechanism. By 'tangential direction of the counter' is here meant a direction which is parallel with the tangent to the circumference of either of the two concentric wheels of the gear mechanism.

The counter can further comprise additional components, for example a cap and/or a means for fastening the counter to a container or a delivery device. Yet the said additional components, for example the cap and/or the means for fastening the counter, if they are present at all, can instead be contained in the container or the delivery device.

The said cap, if it is present at all, can have substantially circular form and can serve as part of an outer casing for certain of the other components of the counter, inter alia the gear mechanism and the pointer unit. Further, the cap can partially be made of a transparent material. The cap can additionally be designed with a dose scale, which is numbered with the number of remaining doses in the container. Yet a dose scale can instead be envisaged contained in the container or the delivery device. The transparent plastics material of the cap allows the pointer unit and/or the marker of the pointer unit to be seen, so that the number of remaining doses in the container can be indicated on a dose scale.

The means for fastening the counter to a container or a delivery device can comprise any chosen suitable solution, for example, that the counter is forced or pressed securely into position and held in place by means of, for example, fitted flange(s), or the like. Further, the means for fastening the counter can also expediently enclose the counter, for example by means of a projecting flange, once it is held in place. Solutions can also be imagined in which the counter is somehow enclosed, without a counter-fastening means, on the holder or the delivery device and such solutions are representative of when there is no counter-fastening means at all present. Further, the counter-

fastening means can also comprise or be, for example, glues, adhesives or the like.

The counter can further be designed with configurations which act in interaction with stabilizing effect when the counter is fixed to the container or the delivery device, i.e. prevent the counter from rotating on the spot. Configurations which act in interaction with stabilizing effect can be in the form of, for example, a pin, or the like, which runs in grooves or bears against a fillet, or vice versa. By 'in interaction' is here meant that the said configurations interact with purpose-made configurations disposed in the stability-enhancing position, for example on the container or the delivery device.

Further, the various components of the counter, inter alia the gear mechanism and the pointer unit, can be produced by any chosen suitable methods, for example, injection moulding, blow moulding, moulding, machine-cutting or welding.

The counter according to the invention can also comprise one or more locking elements, which is/are arranged to act in interaction with locking effect upon the gear mechanism when there is no dose delivered from the container.

If there is a part, for example a retaining spring element, contained in the counter, which, in interaction with some locking position on the gear mechanism, acts with locking effect upon the gear mechanism, then the said locking element is this part.

If, instead, there is a part, for example a retaining spring element, contained in whichever of the container or the delivery device has the counter attached thereto, which part, in interaction with some locking position on the gear

mechanism, acts with locking effect upon the gear mechanism, then the said locking element is these locking positions on the gear mechanism.

Further, the said locking element can be a retaining spring element contained in the said counter.

The counter according to the invention can also comprise one or more elements which is/are arranged so as, upon the said usage motion, to act in interaction such that the gear wheel of greatest diameter is subjected to force action and the gear mechanism hereupon rotates over a predetermined distance.

If there is a structure, for example a spring element, contained in the counter, which, in interaction with the said usage motion, in interaction with some engagement position on the gear wheel of greater diameter, acts with rotary effect upon the gear mechanism, then in this embodiment the said element is this structure.

If, instead, there is a structure, for example a spring element, contained in whichever of the container or the delivery device has the counter attached thereto, which structure, in interaction with the said usage motion, in interaction with some engagement position on the gear wheel of greater diameter, acts with rotary effect upon the gear mechanism, then in these embodiments the said element is these engagement positions on the gear wheel of greater diameter.

The said structure is therefore configured in such a way that, upon the said usage motion, its configuration interacts with whichever of the container or the delivery device does not have the counter attached thereto, so that the structure is subjected firstly to a first force action and thereafter also to a second force action. Such an interaction between the configuration of the structure and the container or delivery device presupposes that the parts, i.e.

parts of the container or delivery device, with which the configuration of the structure interacts are also configured in a specific manner.

In the various embodiments above, the said 'interaction upon the said usage motion' involves the said structure, upon the usage motion, being subjected firstly to the said first force action in a first direction and thereafter also to the said second force action in a second direction. Further, the said first direction and the said second direction are substantially perpendicular to each other. The structure is subjected to the said first and second force action through interaction with whichever of the container or the delivery device does not have the counter attached thereto. For example, a tubular part in which the structure is pressed down, upon the usage motion, can ensure that the structure is subjected to the said first force action. Further, for example, a fillet against which the structure is pressed upon the usage motion can ensure that the structure is subjected to the said second force action.

Further, the structure is firstly subjected to the said first force action, which ensures that the structure resiliently enters into and is held in engagement with some engagement position on the gear wheel of greater diameter. Thereafter, upon the completion of the usage motion, the structure is also subjected to the said second force action, whereupon the structure is resiliently displaced, and as a result of the structure being held in engagement with the gear wheel of greater diameter, the gear mechanism is hereupon displaced over a predetermined distance.

According to the present invention, the ratio between the displacements of the gear mechanism and the pointer unit about the concentric centre axis of the gear mechanism is at least 2:1.

The said ratio between the displacements of the gear mechanism and the pointer unit about the concentric centre axis of the gear mechanism therefore leads to the displacement being geared down from gear mechanism to

pointer unit. The fact that the displacement is geared down from gear mechanism to pointer unit has now enabled a counter to be made available which offers surprisingly high reliability in respect of containers having a larger number of doses than previously.

Within the scope of the invention, however, the two gear wheels of different diameter and the pointer unit can be chosen such that other ratios are obtained between the displacements of the gear mechanism and the pointer unit about the concentric centre axis of the gear mechanism, the said ratios being able to be at least 5:2, 3:1, 7:2, 4:1, 9:2 or 5:1.

A further realization relates to a counter according to the present invention, wherein the counter is triggered, upon the delivery of a dose, by the usage motion and, hereupon, the motion of the counter in relation to the container or the delivery device.

Yet another realization relates to a counter according to the present invention, wherein the counter is triggered, upon the delivery of a dose, by a force influence.

A further realization relates to a counter according to the present invention, wherein the pointer unit is also movably coupled to a part which is non-rotatable once the counter is fastened, the said non-rotatable part being contained either in the counter or in whichever of the container or the delivery device has the counter attached thereto.

The pointer unit can 'also be movably coupled to a part which is non-rotatable once the counter is fastened', by virtue of a realization, for example, in which the pointer unit is fitted between a circular outer flange and the smaller gear wheel. If, for example, the pointer unit, the circular outer flange and the smaller wheel are all respectively designed with a gear ring, the teeth in the gear ring of the pointer unit can in this case be geared in both the gear

ring disposed on the circular outer flange and the gear ring disposed on the smaller wheel. In this realization, the gear ring of the pointer unit is therefore movably coupled to both the other gear rings once the counter is mounted.

Yet another realization relates to a counter according to the present invention, wherein the concentric centre axis of the gear mechanism has its extent in the axial direction of the counter.

A further realization relates to a counter according to the present invention, wherein the said counter comprises a cap and a means for fastening the counter to the container or the delivery device, the cap and the means both having substantially circular cross sections, which circular cross sections are parallel with the plane of the substantially circular form of the said wheels and the pointer unit respectively, and the cap and the means together enclosing the wheels and the pointer unit, wherein, when the pointer unit is also movably coupled to a part which is non-rotatable once the counter is fastened, this part is contained in the counter.

A further realization relates to a counter according to the present invention, wherein the said counter is intended to be fastened to the container.

The said counter can further be intended to be fastened to the upper end of the container.

Yet another realization relates to a counter according to the present invention, wherein the said counter comprises a means for forcing the counter securely into position on the container.

Another realization relates to a counter according to the present invention, wherein the said counter comprises a cap, the said cap being made at least partially of a transparent material and being designed with a dose scale.

Yet another embodiment relates to a counter according to the present invention, wherein the said gear mechanism has a central through-hole for fitting on a shaft.

A further embodiment relates to a counter according to the present invention, the said counter comprising one or more locking elements, which is/are arranged so as, in interaction, to act with locking effect upon the gear mechanism when there is no dose delivered from the container.

The said locking element and its functioning are, for example, as previously described.

Yet another embodiment relates to a counter according to the present invention, wherein the said locking element is a retaining spring element contained in the said counter.

Another realization relates to a counter according to the present invention, wherein the said counter comprises an element which is arranged so as, upon the said usage motion, to act in interaction such that the gear wheel of greatest diameter is subjected to force action and the gear mechanism hereupon rotates over a predetermined distance.

The said element and its functioning are, for example, as previously described.

Yet another realization relates to a counter according to the present invention, wherein the said element is a structure and is contained in the said counter, the structure being configured such that, upon the said usage motion, in interaction with whichever of the container or the delivery device does not have the counter attached thereto, it acts such that the gear mechanism rotates over a predetermined distance.

The said structure and its functioning are, for example, as previously described.

Another realization relates to a counter according to the present invention, wherein the said structure is configured such that, upon the said usage motion, it firstly is displaced resiliently in a first direction and thereafter also in a second direction, which first direction and second direction are substantially perpendicular to each other, when the structure is displaced in the first direction, the structure entering into and being held in engagement with some engagement position on the gear wheel of greater diameter and, when the structure is displaced in the second direction, the gear mechanism being hereupon displaced over a predetermined distance.

The fact that the said structure, which has previously been described in greater detail, is configured in such a way that, upon the said usage motion, the structure is subjected firstly to a first force action and thereafter also to a second force action, whereby the structure, as already mentioned, is firstly displaced resiliently in the said first direction and thereafter also in the said second direction, has now enabled a counter to be made available which has a surprisingly handy and simple structure with maintained high reliability.

If a part and/or structure, as herein described, is instead contained in whichever of the container or the delivery device has the counter attached thereto, then a description applies to the part or the structure which corresponds to the description when they are contained in a counter according to the present invention.

The present invention additionally relates to a counter for counting the number of doses delivered from a container, in which a dose, as a result of a usage motion, is delivered from the container by way of a delivery device and, upon which usage motion, the container moves in relation to the delivery device, wherein the counter, which has an axial direction and a tangential

direction and is fastened to the container or the delivery device, comprises a pointer device comprising a wheel and a marker means, wherein the pointer device is rotatable and the marker means is displaceable about the concentric centre axis of the gear mechanism once the counter is fastened and the said wheel has a substantially circular form, the counter being triggered upon the delivery of a dose, wherein the said counter comprises an element which is arranged so as, upon the said usage motion, to act in interaction such that the wheel of the pointer device is subjected to force action, whereupon the pointer device is rotated and the marker means is displaced over a respective predetermined distance, and both the pointer device and the marker means are displaced about the concentric centre axis of the gear mechanism.

The fact that the said element, which has previously been described in greater detail, is arranged so as, upon the said usage motion, to act in interaction such that the wheel of the pointer device is subjected to force action, whereupon the pointer device is rotated and the marker means is displaced over a respective predetermined distance, has now enabled a counter to be made available which has a surprisingly handy and simple structure with maintained high reliability.

A further realization relates to a counter according to the present invention, wherein the said element is a structure and is contained in the said counter, the structure being configured such that, upon the said usage motion, in interaction with whichever of the container or the delivery device does not have the counter attached thereto, it acts such that the pointer device is rotated and the marker means is displaced over a respective predetermined distance.

Yet another realization relates to a counter according to the present invention, wherein the said structure is configured such that, upon the said usage motion, it firstly is displaced resiliently in a first direction and thereafter

also in a second direction, which first direction and second direction are substantially perpendicular to each other, when the structure is displaced in the first direction, the structure entering into and being held in engagement with some engagement position on the wheel of the pointer device and, when the structure is displaced in the second direction, the pointer device and the marker means being hereupon displaced over a respective predetermined distance.

The fact that the said structure, which has previously been described in greater detail, is configured in such a way that, upon the said usage motion, the structure is subjected firstly to a first force action and thereafter also to a second force action, whereby the structure, as already mentioned, is firstly displaced resiliently in the said first direction and thereafter also in the said second direction, has now enabled a counter to be made available which has a surprisingly handy and simple structure with maintained high reliability.

If a part and/or structure, as herein described, is instead contained in whichever of the container or the delivery device has the counter attached thereto, then a description applies to the part or the structure which corresponds to the description when they are contained in a counter according to the present invention.

A further realization relates to a counter according to the present invention, wherein the concentric centre axis of the pointer device has its extent in the axial direction of the counter.

Yet another realization relates to a counter according to the present invention, wherein the said counter comprises a cap and a means for fastening the counter to the container or the delivery device, the cap and the means both having substantially circular cross sections, which circular cross sections are parallel with the plane of the substantially circular form of the

said wheel, and the cap and the means together enclosing the wheel and the marker means.

A further realization relates to a counter according to the present invention, wherein the said counter is intended to be fastened to the container.

Another realization relates to a counter according to the present invention, wherein the said counter is intended to be fastened to the upper end of the container.

Yet another realization relates to a counter according to the present invention, wherein the said counter comprises a means for forcing the counter securely into position on the container.

Another realization relates to a counter according to the present invention, wherein the said counter comprises a cap, the said cap being made at least partially of a transparent material and being designed with a dose scale.

Yet another realization relates to a counter according to the present invention, wherein the said pointer device has a central through-hole for fitting on a shaft.

Another realization relates to a counter according to the present invention, wherein the said counter comprises one or more locking elements, which is/are arranged to act in interaction with locking effect upon the pointer device when there is no dose delivered from the container.

Yet another embodiment relates to a counter according to the present invention, wherein the said locking element is a retaining spring element contained in the said counter.

Another realization relates to a counter according to the present invention, wherein the pointer device is a pointer wheel comprising a wheel and a marker means, which is a pointing means.

Another realization relates to a counter according to the present invention, wherein the pointer device is a gear mechanism, which comprises two concentric wheels of different diameter in mutually fixed arrangement, and a marker means, which is a pointer unit, both the gear mechanism and the pointer unit being rotatable once the counter is fastened, wherein the said wheels and the pointer unit have a substantially circular form and wherein the wheel of least diameter and the pointer unit are movably coupled, the counter being triggered upon the delivery of a dose, and the gear wheel of greatest diameter being subjected to force action, whereupon the gear mechanism is rotated over a predetermined distance and, by virtue of the movable coupling, the pointer unit is also rotated over a predetermined distance, and both the gear mechanism and the pointer unit are displaced about the concentric centre axis of the gear mechanism, a ratio of at least 2:1 being obtained between the displacements of the gear mechanism and pointer unit respectively.

Another realization relates to a counter according to the present invention, wherein the pointer unit is also movably coupled to a part which is non-rotatable once the counter is fastened, the said non-rotatable part being contained either in the counter or in whichever of the container or the delivery device has the counter attached thereto.

Yet another realization relates to a counter according to the present invention, wherein the part which is non-rotatable once the counter is fastened is contained in the counter.

The present invention additionally relates to a delivery device which is designed, in movable arrangement, with a container and incorporates a counter according to the present invention.

BRIEF DESCRIPTION OF THE FIGURES

The invention is described in greater detail below with reference to the illustrative embodiments shown in the appended drawings. The illustrative embodiments illustrate, but in no way limit, the invention, wherein:

Fig. 1 shows a perspective view, viewed from the front, of a counter according to the invention, with its four main components exploded apart;

Fig. 2 shows a perspective view, viewed from the front, of a means for forcing a counter according to the invention securely into position on a spray container;

Fig. 3 shows a perspective view, viewed from the front, of a section of the upper part of a spray dose inhaler designed with a counter according to the invention.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

Fig. 1 shows a perspective view, viewed from the front, of a counter 2 which is intended to be disposed on a delivery device, for example a spray dose inhaler. The counter 2 consists of four main components: a cap 7, a pointer unit 8, a gear mechanism 9 and a means 10 for forcing the counter 2 securely into position, which four main components in Fig. 1 are exploded apart. In the outermost position is disposed the substantially circular cap 7, which thus serves as an outer casing for the upper part of the counter. Like the cap 7, other main components have a substantially circular cross section and the cross sections of the other main components are parallel with the

plane of the cap. An axial direction X and a tangential direction Y are also inserted in Fig. 1.

On the cap 7 there is disposed a substantially rectangular pin 12. When the delivery device is in use, the pin 12 can run in a recess in, for example, the delivery device. The cap 7 is partially made of a transparent plastics material and the pin 12 is directed downward and disposed substantially perpendicular to the substantially circular plane of the cap. Further, a dose scale 13, which is numbered from 120 to 0 remaining doses in a container, for example a spray container, belonging to the delivery device, is disposed on the outer edge of the cap 7. Through the transparent plastics material of the cap, the marker 14 of the pointer unit is visible, which marker shows on the dose scale 13 the number of remaining doses left in the container.

The means 10 has a lower part 15 and an upper part 16, which parts, 15 and 16, are put together using a circular plate 17. The lower part 15 comprises a first circular outer flange 18, which projects downward from the circular plate. The lower part 15 can therefore be fitted in place using the first circular outer flange 18 and forced onto a spray container.

The upper part 16 comprises a second circular outer flange 19, which projects upward from the circular plate 17. In the upper part 16 can be fitted the other main components of the counter. Further, a gear ring 20 is disposed in the upper part 16 on the inner side of the second circular outer flange 19. In addition, a shaft 21 is centrally disposed in the upper part 16, the shaft 21 projecting upward from the circular plate 17.

The diameter of the lower part on the circular cross section is somewhat smaller than the corresponding diameter of the upper part. Further, an approximately rectangular recess 22 is disposed in the means 10, the recess 22 having its extent in both the lower part 15 and the upper part 16. Disposed at the recess 22 and integrated within the lower part 15 having the first

circular outer flange 18 is an element, here a plastics spring element 23. The spring element 23, and especially its left edge, extends firstly obliquely to the left in the upward direction and thereafter substantially straight upward in the recess 22 (by 'left' is here meant on the left-hand side in Fig. 1). At its upper end, the spring element 23 is provided on the inner side with a means 24 (only partially visible in Fig. 1, see Fig. 2) which can be pressed, and geared, against teeth in a gear ring. Further, the spring element 23 has the capacity to be resiliently displaced in the tangential direction Y when the spring element 23 is subjected to a force action in the tangential direction Y.

Disposed in and integrated with the means 10 is a locking element, here a retaining spring element 25 (not visible in Fig. 1, see Fig. 2). The retaining spring element 25 is integrated with the circular plate 17 by means of a recess 26 (not visible in Fig. 1, see Fig. 2) running along the periphery of the circular plate. Further, the retaining spring element 25 has its extent in the recess 26 and on the free end 27 of the retaining spring element there is disposed, in the upward direction, a locking means 28 (not visible in Fig. 1, see Fig. 2). The locking means 28 tends upward in the upper part 16, so that the retaining spring element 25 can act with locking effect as a result of the locking means 28 being pressed, and geared, against teeth in a gear ring.

Further, in the upper part 16, on the upper edge 29 of the second circular outer flange, there are disposed on the outer side two parallel circumferential grooves 30 and 31, with the formation therebetween of a circumferential fillet 32. The circumferential fillet 32 is interrupted by a groove region 33 on the second circular outer flange 19, which groove region 33 extends from the upper edge 29 of the second circular outer flange to the recess 22 in the upper part 16. Further, the groove region 33 has a greater width than the recess 22 in the tangential direction Y. In addition, the imaginary centre lines in the axial direction X of the groove region 33 and of the recess 22 coincide.

The gear mechanism 9 comprises two concentric wheels 34 and 35 of different diameter lying one on top of the other in mutually fixed arrangement. The wheels 34 and 35 have a substantially circular form and a central through-hole 36. The larger wheel 34 is fitted in the upper part 16 facing toward the circular plate 17, whilst the smaller wheel 35 faces upward. In the fitting of the gear mechanism 9, the centrally disposed shaft 21 in the upper part 16 is introduced into the hole 36. Further, the larger wheel 34 is designed with a horizontal gear ring 37 along the periphery of its bottom side. It is upon the horizontal gear ring 37 of the larger wheel that both the previously described elements, the spring element 23 and the retaining spring element 25, act.

In the use of a spray dose inhaler, when, as a result of a so-called usage motion, the counter 2 is pressed down and the spray container is pressed farther into the upper tubular part of the spray dose inhaler, the spring element 23 will be pressed in against the horizontal gear ring 37 in the gear mechanism 9, whereupon the means 24 (only partially visible in Fig. 1, see Fig. 2) of the spring element is geared against teeth in the gear ring 37.

after the spring element 23 has been pressed in against the horizontal gear ring 37, the spring element 23, upon completion of the usage motion, will be subjected to a force action in the tangential direction, Y, on its upper end, whereupon the spring element 23 is resiliently displaced in the tangential direction Y. In the realization according to Fig. 1, the resilient displacement of the spring element in the tangential direction Y will lead to the gear wheel 34 of greatest diameter being subjected to force action. The gear mechanism 9 will hereupon be displaced over a predetermined distance, here 6°, in the tangential direction Y about the centre axis of the gear mechanism, upon completion of the usage motion. The centre axis of the gear mechanism has its extent in the axial direction X.

The retaining spring element 25 (not visible in Fig. 1, see Fig. 2), having locking means 28 (not visible in Fig. 1, see Fig. 2) tending upward in the upper part 16, acts with locking effect upon the gear mechanism 9 when the spray dose inhaler is not in use, as a result of the locking means 28 being pressed, and geared, against teeth in the horizontal gear ring 37 in the gear mechanism 9. In other words, the retaining spring element 25 ensures that the gear mechanism 9 is held in place when the spray dose inhaler is not in use.

The smaller wheel 35 in the gear mechanism 9 is designed with a vertical gear ring 38 running around the outer edge of the smaller wheel.

The pointer unit 8 has, as previously described, a substantially circular cross section and has substantially the form of a wheel. Further, the pointer unit 8 is designed with a marker 14, which is placed centrally on the top side 39 of the pointer unit. The pointer unit 8 is designed with a vertical gear ring 40 running around the outer edge of the pointer unit.

The pointer unit 8 is fitted between the second circular outer flange 19 of the upper part 16 and the smaller wheel 35 in the gear mechanism 9. The teeth in the gear ring 40 of the pointer unit are herein geared in both the gear ring 20, disposed on the second circular outer flange 19, and the gear ring 38, disposed on the smaller wheel 35 in the gear mechanism 9. The gear ring 40 of the pointer unit is therefore movably coupled both to the gear ring 20 and to the gear ring 38 when the counter 2 is mounted.

In the realization according to Fig. 1, when the gear mechanism 9 is displaced by 6° in the tangential direction Y about the centre axis of the gear mechanism upon completion of the usage motion, the pointer unit 8 and its marker 14, as a result of the action of the gear mechanism device and the movable coupling with the pointer unit 8, will be displaced by about 2.5° in the tangential direction Y about the centre axis of the gear mechanism. In the

realization according to Fig. 1, the approx. 2.5° displacement of the marker 14 will be visible through the cap 7 and the marker 14 will show on the dose scale 13 that the number of remaining doses has reduced by one in a holder, for example a spray container.

The cap 7 is designed with a third circular outer flange 41, which outer flange 41 is directed downward and disposed substantially perpendicular to the substantially circular plane of the cap. Further, the third circular outer flange 41 is conceived internally with a circumferential groove 42 (not visible in Fig. 1). The circumferential groove 42 is interrupted by a region 43 (not visible in Fig. 1) having a width in the tangential direction Y which corresponds to the width of the groove region 33 in the tangential direction Y on the second circular outer flange 19. Further, the circumferential groove 42 is intended to receive the circumferential fillet 32 in the upper part 16 of the means 10.

When the counter 2 is mounted, the cap 7 is therefore slipped onto the upper part 16 of the means 10. After this, the cap 7 is snapped in place by being pressed over the circumferential fillet 32, whereupon the fillet 32 is received by the circumferential groove 42.

The pointer unit 8 and the gear mechanism 9 are therefore held in place, in the upper part 16 of the means 10, by the cap 7. Once the cap 7 is in place, the substantially rectangular pin 12 and the region 43 are fitted in the groove region 33 of the second circular outer flange 19. Further, the pin 12 runs downward over the recess 22 in the means 10.

Further, the cap 7, on its top side, is designed with a centred cup-shaped groove 44, which groove 44 makes the cap easier to grip in the use of a delivery device, for example a spray dose inhaler. A circumferential portion 45, made of a transparent plastics material, and the dose scale 13 surround the groove 44 in the order stated. The circumferential portion 45 and the

dose scale 13 are interrupted on the top side of the cap directly in front of the pin 12.

Fig. 2 shows a perspective view, viewed from the top, of the means 10 for forcing the counter 2 securely into position on a container, for example a spray container. Further, the lower part 15, the upper part 16 and the circular plate 17 are visible. Other parts which are not specifically described below are as specified for the means 10 under the description of Fig. 1.

Here it can be seen that the gear ring 20, which is disposed in the upper part 16, is interrupted directly in front of the recess 11.

It can further be seen that the spring element 23, on the inner side, is provided with the means 24.

The retaining spring element 25, which is integrated with the circular plate 17 at the recess 26 running along the periphery of the circular plate, is also visible here. It can further be seen that the retaining spring element 25 has its extent in the recess 26. On the free end 27 of the retaining spring element there can also be seen the locking means 28, which tends upward in the upper part 16.

Also visible are the two parallel circumferential grooves 30 and 31 and the circumferential fillet 32 situated therebetween.

Fig. 3 shows a perspective view, viewed from the front, of a section of the upper part of a spray dose inhaler 100 designed with a counter 2. The counter 2 is forced securely into position on the upper end of a spray container 104 belonging to the spray dose inhaler 100.

Further, the spray dose inhaler 100 has an upper tubular part 103, in which tubular part 103 a container, here a spray container 104, is inserted. The

spray container 104 has an upper and a lower end, and on the upper end of the spray container, which coincides with the upper end of the spray dose inhaler, a counter 2 has been forced securely into position. Further, the spray dose inhaler 100 has a lower, tubular mouthpiece part (not visible in Fig. 3), which is angled in relation to the upper part 103 and which emerges in an opening (not visible in Fig. 3) from which the content of the spray container 104 is delivered. When the spray dose inhaler 100 is used, the mouthpiece part (not visible in Fig. 3) is introduced into the mouth of the user, the counter 2 is pressed down and hence the spray container 104 is pressed farther into the upper part 103 of the spray dose inhaler 100. A dose is hereupon released, which is sprayed into the mouth cavity of the user.

It will here be appreciated in Fig. 3, moreover, how the upper tubular part 103 of the spray dose inhaler acts upon the spring element 23 when the spray dose inhaler 100 is used. As a result of the usage motion, when the counter 2 is pressed down and the spray container 104 is pressed farther into the upper tubular part 103 of the spray dose inhaler 100, the upper tubular part 103 will firstly press in the spring element 23 against the horizontal gear ring 37. After this, upon completion of the usage motion, a fillet 46, extending in the axial direction X on the inner side of the upper tubular part 103, will subject the spring element 23 to a force action in the tangential direction Y. The said force action in the tangential direction Y is engendered, upon completion of the usage motion, by the interaction of the fillet 46 with the configuration of the spring element. By 'configuration of the spring element' is here meant that the spring element 23 firstly extends obliquely upward in the axial direction X. Further, the said force action means that the spring element 23 is resiliently displaced in the tangential direction Y, whereupon the gear mechanism 9 is displaced by 6° in the tangential direction Y.

Further, through interaction of the spring element 23 and the fillet 46, the spring element 23 acts also as 'a configuration which, in interaction, acts with stabilizing effect when the counter is fixed to the container'.

PATENT CLAIMS

1. Counter (2) for counting the number of doses delivered from a container (104), in which a dose, as a result of a usage motion, is delivered from the container (104) by way of a delivery device (100) and, upon which usage motion, the container (104) moves in relation to the delivery device (100), wherein the counter (2), which has an axial direction (X) and a tangential direction (Y) and is fastened to the container (104) or the delivery device (100), comprises a gear mechanism (9) comprising two concentric wheels (34, 35) of different diameter in mutually fixed arrangement, and a pointer unit (8), both the gear mechanism (9) and the pointer unit (8) being rotatable once the counter (2) is fastened, characterized in that the said wheels (34, 35) and the pointer unit (8) have a substantially circular form, and in that the wheel of least diameter (35) and the pointer unit (8) are movably coupled, the counter (2) being triggered whenever a dose is delivered, and the gear wheel of greatest diameter (34) being subjected to force action, whereupon the gear mechanism (9) is rotated over a predetermined distance and, by virtue of the movable coupling, the pointer unit (8) is also rotated over a predetermined distance, and both the gear mechanism (9) and the pointer unit (8) are displaced about the concentric centre axis of the gear mechanism, a ratio of at least 2:1 being obtained between the displacements of the gear mechanism and pointer unit respectively.

2. Counter (2) according to Patent Claim 1, characterized in that the counter (2) is triggered, upon the delivery of a dose, by the usage motion and, hereupon, the motion of the counter in relation to the container (104) or the delivery device (100).

3. Counter (2) according to Patent Claim 1, characterized in that the counter (2) is triggered, upon the delivery of a dose, by a force influence.

4. Counter (2) according to any one of Patent Claims 1 to 3, characterized in that the pointer unit (8) is also movably coupled to a part which is non-rotatable once the counter (2) is fastened, the said non-rotatable part being contained either in the counter (2) or in whichever of the container (104) or the delivery device (100) has the counter (2) attached thereto.

5. Counter (2) according to any one of Patent Claims 1 to 4, characterized in that the concentric centre axis of the gear mechanism has its extent in the axial direction (X) of the counter.

6. Counter (2) according to any one of Patent Claims 1 to 5, characterized in that the said counter (2) comprises a cap (7) and a means (10) for fastening the counter (2) to the container (104) or the delivery device (100), the cap (7) and the means (10) both having substantially circular cross sections, which circular cross sections are parallel with the plane of the substantially circular form of the said wheels (34, 35) and the pointer unit (8) respectively, and the cap (7) and the means (10) together enclosing the wheels (34, 35) and the pointer unit (8), wherein, when the pointer unit (8) is also movably coupled to a part which is non-rotatable once the counter (2) is fastened, this part is contained in the counter (2).

7. Counter (2) according to any one of Patent Claims 1 to 6, characterized in that the said counter (2) is intended to be fastened to the container (104).

8. Counter (2) according to Patent Claim 7, characterized in that the said counter (2) is intended to be fastened to the upper end of the container.

9. Counter (2) according to any one of Patent Claims 1 to 8, characterized in that the said counter (2) comprises a means (10) for forcing the counter (2) securely into position on the container (104).

10. Counter (2) according to any one of Patent Claims 1 to 9, characterized in that the said counter (2) comprises a cap (7), the said cap (7) being made at least partially of a transparent material and being designed with a dose scale (13).

11. Counter (2) according to any one of Patent Claims 1 to 10, characterized in that the said gear mechanism (9) has a central through-hole (36) for fitting on a shaft (21).

12. Counter (2) according to any one of Patent Claims 1 to 11, characterized in that the said counter (2) comprises one or more locking elements (25), which is/are arranged so as, in interaction, to act with locking effect upon the gear mechanism (9) when there is no dose delivered from the container (104).

13. Counter (2) according to Patent Claim 12, characterized in that the said locking element (25) is a retaining spring element (25) contained in the said counter (2).

14. Counter (2) according to any one of Patent Claims 2 and 4 to 13, characterized in that the said counter (2) comprises an element (23) which is arranged so as, upon the said usage motion, to act in interaction such that the gear wheel of greatest diameter (34) is subjected to force action and the gear mechanism (9) hereupon rotates over a predetermined distance.

15. Counter (2) according to Patent Claim 14, characterized in that the said element (23) is a structure (23) and is contained in the said counter (2), the structure (23) being configured such that it acts, upon the said usage motion, in interaction with whichever of the container (104) or the delivery device (100) does not have the counter (2)

attached thereto, such that the gear mechanism (9) rotates over a predetermined distance.

16. Counter (2) according to Patent Claim 15, characterized in that the said structure (23) is configured such that, upon the said usage motion, it firstly is displaced resiliently in a first direction and thereafter also in a second direction, which first direction and second direction are substantially perpendicular to each other, when the structure (23) is displaced in the first direction, the structure (23) entering into and being held in engagement with some engagement position (37) on the gear wheel (34) of greater diameter and, when the structure (23) is displaced in the second direction, the gear mechanism (9) being hereupon displaced over a predetermined distance.

17. Counter (2) for counting the number of doses delivered from a container (104), in which a dose, as a result of a usage motion, is delivered from the container (104) by way of a delivery device (100) and, upon which usage motion, the container (104) moves in relation to the delivery device (100), wherein the counter (2), which has an axial direction (X) and a tangential direction (Y) and is fastened to the container (104) or the delivery device (100), comprises a pointer device (9) comprising a wheel (34) and a marker means (8), wherein the pointer device (9) is rotatable and the marker means (8) is displaceable about the concentric centre axis of the gear mechanism, once the counter (2) is fastened, and the said wheel (34) has a substantially circular form, the counter (2) being triggered upon the delivery of a dose, characterized in that the said counter (2) comprises an element (23) which is arranged so as, upon the said usage motion, to act in interaction such that the wheel (34) of the pointer device is subjected to force action, whereupon the pointer device (9) is rotated and the marker means (8) is displaced over a respective predetermined distance, and both the pointer device (9) and the marker means (8) are displaced about the concentric centre axis of the gear mechanism.

18. Counter (2) according to Patent Claim 17, characterized in that the said element (23) is a structure (23) and is contained in the said counter (2), the structure (23) being configured such that, upon the said usage motion, in interaction with whichever of the container (104) or the delivery device (100) does not have the counter (2) attached thereto, it acts such that the pointer device (9) is rotated and the marker means (8) is displaced over a respective predetermined distance.

19. Counter (2) according to Patent Claim 18, characterized in that the said structure (23) is configured such that, upon the said usage motion, it firstly is displaced resiliently in a first direction and thereafter also in a second direction, which first direction and second direction are substantially perpendicular to each other, when the structure (23) is displaced in the first direction, the structure (23) entering into and being held in engagement with some engagement position (37) on the wheel (34) of the pointer device and, when the structure (23) is displaced in the second direction, the pointer device (9) and the marker means (8) being hereupon displaced over a respective predetermined distance.

20. Counter (2) according to any one of Patent Claims 17 to 19, characterized in that the concentric centre axis of the pointer device has its extent in the axial direction (X) of the counter.

21. Counter (2) according to any one of Patent Claims 17 to 20, characterized in that the said counter (2) comprises a cap (7) and a means (10) for fastening the counter (2) to the container (104) or the delivery device (100), the cap (7) and the means (10) both having substantially circular cross sections, which circular cross sections are parallel with the plane of the substantially circular form of the said wheel (34), and the cap (7) and the means (10) together enclosing the wheel (34) and the marker means (8).

22. Counter (2) according to any one of Patent Claims 17 to 21, characterized in that the said counter (2) is intended to be fastened to the container (104).

23. Counter (2) according to Patent Claim 22, characterized in that the said counter (2) is intended to be fastened to the upper end of the container.

24. Counter (2) according to any one of Patent Claims 17 to 23, characterized in that the said counter (2) comprises a means (10) for forcing the counter (2) securely into position on the container (104).

25. Counter (2) according to any one of Patent Claims 17 to 24, characterized in that the said counter (2) comprises a cap (7), the said cap (7) being made at least partially of a transparent material and being designed with a dose scale (13).

26. Counter (2) according to any one of Patent Claims 17 to 25, characterized in that the said pointer device (9) has a central through-hole (36) for fitting on a shaft (21).

27. Counter (2) according to any one of Patent Claims 17 to 26, characterized in that the said counter (2) comprises one or more locking elements (25), which is/are arranged to act in interaction with locking effect upon the pointer device (9) when there is no dose delivered from the container (104).

28. Counter (2) according to Patent Claim 27, characterized in that the said locking element (25) is a retaining spring element (25) contained in the said counter (2).

29. Counter (2) according to any one of Patent Claims 17 to 28, characterized in that the pointer device (9) is a pointer wheel comprising a wheel and a marker means (8) which is a pointing means.

30. Counter (2) according to any one of Patent Claims 17 to 28, characterized in that the pointer device (9) is a gear mechanism (9), which comprises two concentric wheels (34, 35) of different diameter in mutually fixed arrangement, and a marker means (8) which is a pointer unit (8), both the gear mechanism (9) and the pointer unit (8) being rotatable once the counter (2) is fastened and the said wheels (34, 35) and the pointer unit (8) having a substantially circular form, and in that the wheel (35) of least diameter and the pointer unit (8) are movably coupled, the counter (2) being triggered upon the delivery of a dose, and the gear wheel of greatest diameter (34) being subjected to force action, whereupon the gear mechanism (9) is rotated over a predetermined distance and, by virtue of the movable coupling, the pointer unit (8) is also rotated over a predetermined distance, and both the gear mechanism (9) and the pointer unit (8) are displaced about the concentric centre axis of the gear mechanism, a ratio of at least 2:1 being obtained between the displacements of the gear mechanism and pointer unit respectively.

31. Counter (2) according to Patent Claim 30, characterized in that the pointer unit (8) is also movably coupled to a part which is non-rotatable once the counter (2) is fastened, the said non-rotatable part being contained either in the counter (2) or in whichever of the container (104) or the delivery device (100) has the counter (2) attached thereto.

32. Counter (2) according to Patent Claim 31, characterized in that the part which is non-rotatable once the counter (2) is fastened is contained in the counter (2).

33. Delivery device (100) designed, in movable arrangement, with a container (104), characterized in that it incorporates the counter (2) according to any one of Patent Claims 1 to 32.

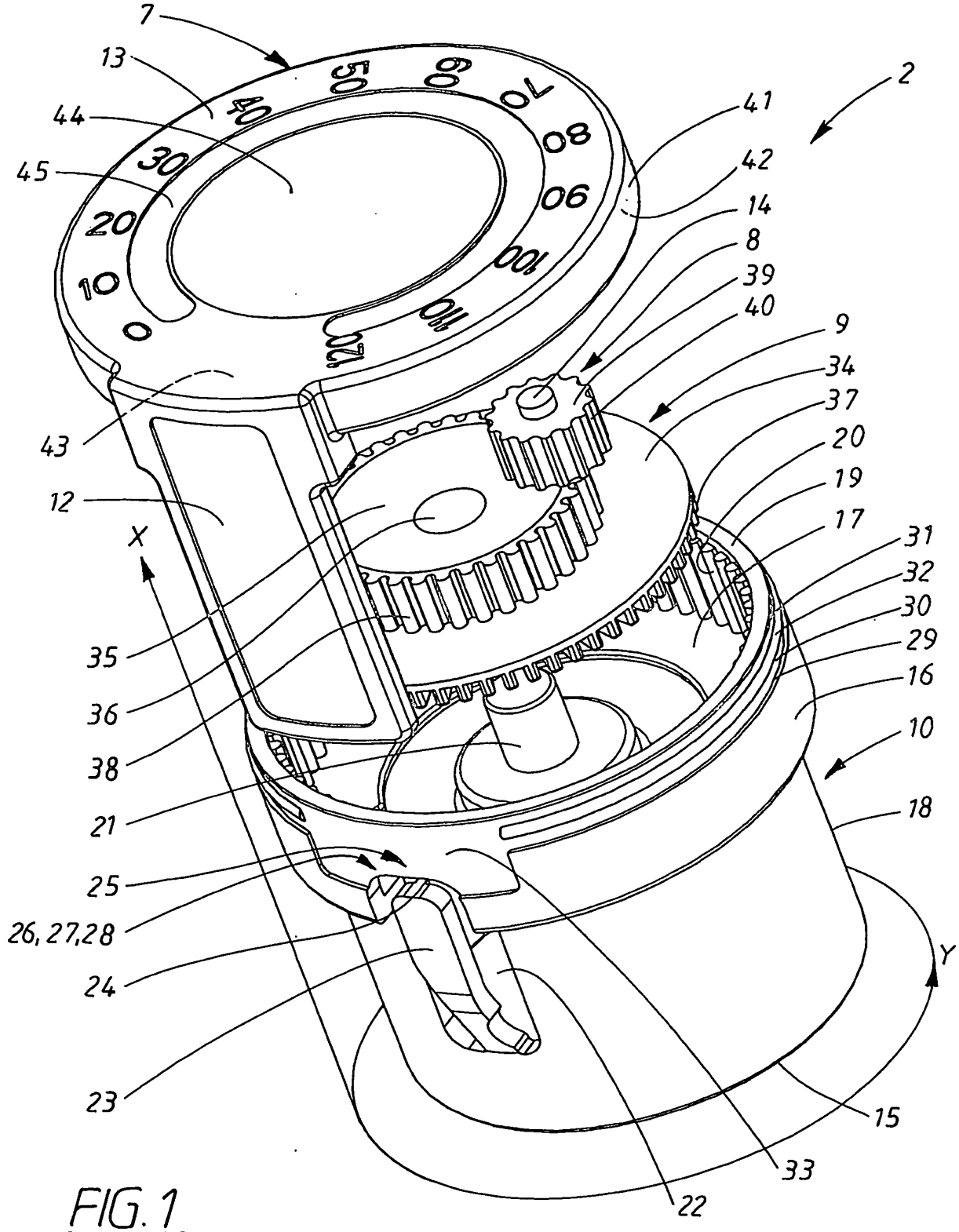
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FIG. 1

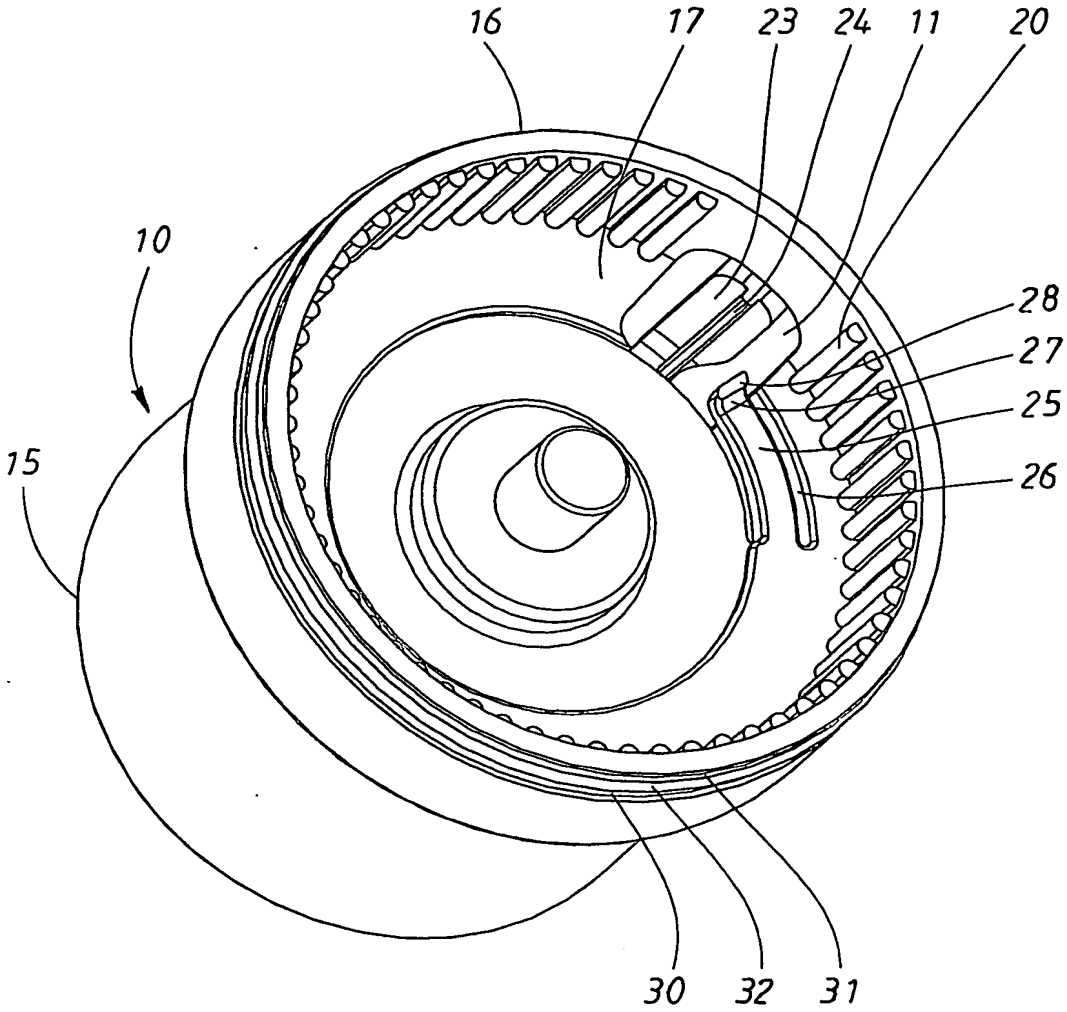

FIG. 2

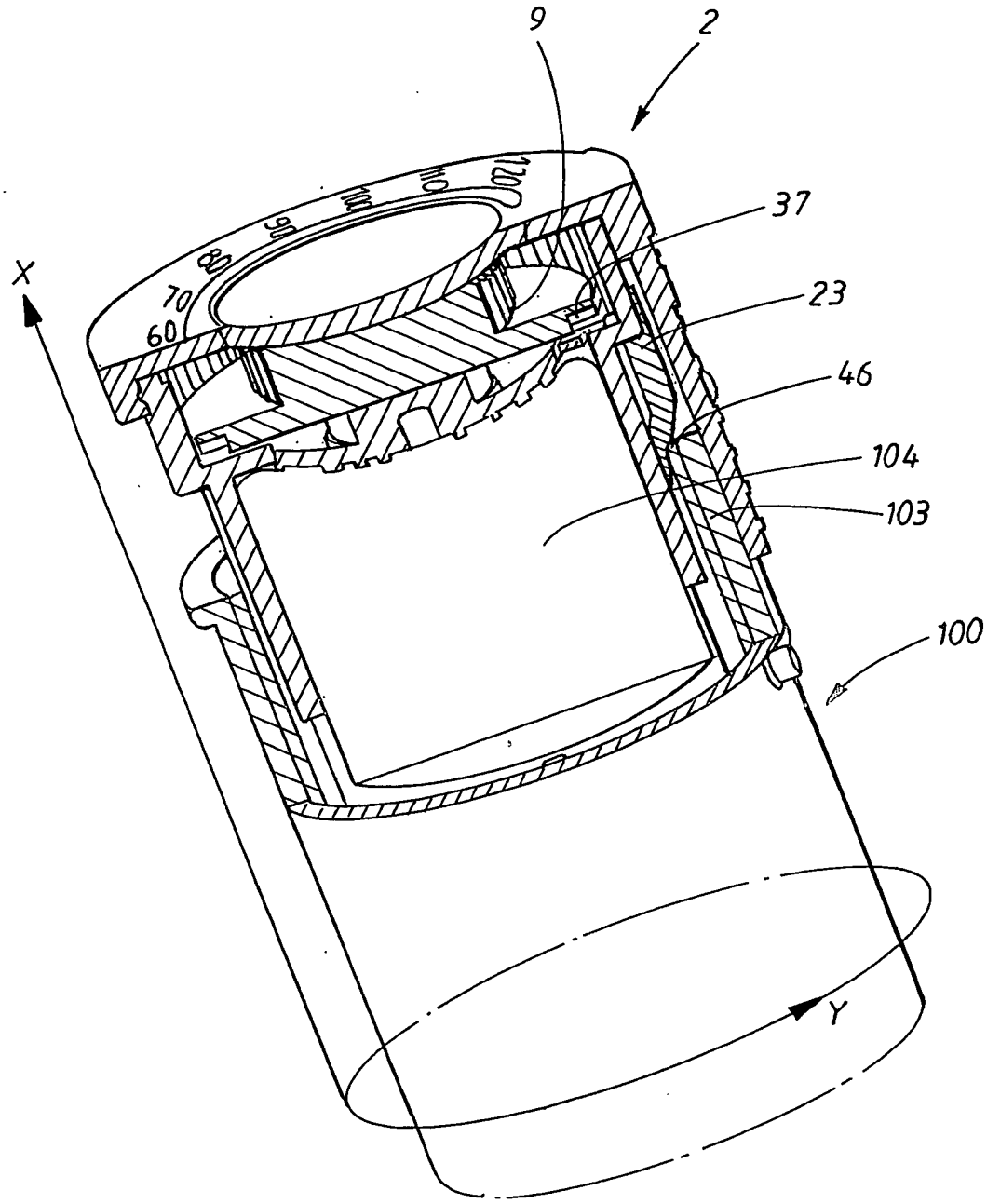

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2004/000546

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61M 15/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9209324 A1 (MINNESOTA MINING AND MANUFACTURING COMPANY), 11 June 1992 (11.06.1992), abstract --	1-33
A	WO 9508484 A1 (SENETICS, INC.), 30 March 1995 (30.03.1995), abstract --	1-33
A	EP 0254391 A1 (GLAXO GROUP LIMITED), 27 January 1988 (27.01.1988), abstract --	1-33
A	WO 9724586 A1 (CIRALLO, PASQUALE), 10 July 1997 (10.07.1997), abstract --	1-33

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 July 2004	12-07-2004
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Nils Nordin/BS Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

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30/04/2004

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